Zowie Intertainment, Inc

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Company At A Glance:

Zowie Intertainment, Inc. is a start-up company initially funded by technology visionary and investor Paul Allen that designs and develops smart toys and other technology-based entertainment products. Headquartered in Silicon Valley, Zowie Intertainment has a portfolio of proprietary sensing and recognition technologies -- Zowie Power™ -- which allows the movement and manipulation of three-dimensional figures and objects to control and change on-screen activities.

Zowie Power technology is the result of years of research that began with Paul Allen's renowned Silicon Valley technology think tank Interval Research and its partner Scientific Generic, a Cambridge, England-based engineering and research center. Zowie's philosophy – to develop technologies that enhance natural human interactions rather than change or direct them – was carried over from Interval and has been fundamental in the development of Zowie Power technology and the company's first line of products, Zowie PlayZones – the only smart toys that enable kids to manipulate and change in real-time on-screen worlds and characters through natural play patterns. The result is an enhanced play environment that seamlessly blends in the child's mind both the physical PlayZone world and the on-screen world. Zowie PlayZones will be available nationwide in mass merchant and specialty stores this fall 1999.

Zowie's experienced and diverse management team boasts the creator of Pong and the marketing visionary behind Sonic the Hedgehog, as well as executives from Hasbro, Time Warner, Apple Computer and Ph.D.s from Stanford University's Knowledge Systems Laboratory. This blending of pioneers from a variety of disciplines has resulted in a company that is developing a portfolio of technologies that will enhance a variety of entertainment activities through its own branded products or via other established brands. Zowie Power technology is poised to become an industry standard, and will be adopted by other companies for use inside games, books and a variety of other products. The first third-party OEM products, sporting the Zowie Power insignia, will be introduced in 2000.

Investor Information:

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Smarter Play for Smart Toys

The Benefits of Technology-Enhanced Play

A Zowie Intertainment White Paper

Helen Shwe, Author
Amy Francetic, Editor

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Executive Summary

Technology is changing the way children play. The rapid diffusion of technology into everyday lives has finally reached its youngest audience. Although the definition of play has extended to include new types of interaction with technology, the qualities that make play fun and beneficial for children have not changed. Play is an active, social, and fantasy world in which children have control and can do what comes naturally. Our research with hundreds of children suggests that they can benefit from Smart Toys when they are designed to be toys first and smart second. This paper will first explore the growing Smart Toy category and describe the Zowie™ PlayZones, and then will describe the benefits of technology-enhanced play as revealed by our research and the research of leading developmental and behavioral psychologists.

Smart Toys combine the best of two worlds - traditional toys and the power of computers and electronic chips. Experts predict that almost every toy will be powered by interactive technology in the very near future. Today's techno-savvy kids crave increasingly sophisticated play experiences and this need, combined with a burgeoning home PC market, are paving the way for the next wave of technologically advanced toys.

Zowie Intertainment is a new high-tech toy and entertainment company that creates innovative play experiences for both children and adults. The company spun out of Interval Research where the team investigated a new, toy-like way to harness the power of the computer. Founded in 1992 by computer visionaries, Paul Allen and David Liddle, Interval is a laboratory that performs research and advanced development.

In February of 1998, Zowie became a separate company with seed funding from Interval and its technology partner Scientific Generics of Cambridge, England. Upon the creation of this separate company, the focus of the team switched from research to engineering for manufacturing and producing commercially viable products.

Zowie's vision is to integrate Zowie Power technology into toys, books, board games, and other types of entertainment products with Zowie branded

characters and other established brands. Zowie™ PlayZones are the first line of products of these unique play experiences that will be sold in toy stores and computer stores in September of 1999.

The Zowie team strives to create play experiences that are not only fun and entertaining but also good for kids. By observing hundreds of children playing with traditional toys, Zowie has developed a design methodology that focuses on enhancing and extending children's play rather than trying to control or change it. The result of this in-depth play research is an innovative line of Smar Toys that inspire children's fantasy and pretend play, encourage social cooperative play, promote hands-on active play, encourage child-directed play, and strengthen children's symbolic-representation skills.

Smart Toy Category

Smart Toys can be broadly defined as toys that leverage computing power. This includes toys that connect to the PC and toys that contain sophisticated sensors and chips that enhance their play value. Recent additions to the category include Microsoft's Actimates™ , Lego Mindstorms® Robotics Discovery Set, an Mattel's Talk With Me Barbie™ .

The Smart Toy category has evolved from several other product categories, including video games, electronic toys, and children's software. The Smart Toy segment is expected to grow to more than $2 billion by the year 2003 (Forreste Research). A number of factors are contributing to the growth of the Smart Toy segment including the increasingly sophisticated tastes of children today and the widespread penetration of home PC's.

"Some of today's smart toys could have been delivered ten years ago, but they wouldn't have been affordable," explains toy analyst, Sean McGowan. "The decreasing cost of technology and the increasingly sophisticated tastes of kids are driving the sector."

Toy and Video Game Markets

In 1998 the toy business was flat in growth and measured $18.4 billion in sales (Gerard Klauer Mattison). Growth of the toy business as a whole is traditionally very modest, averaging 3-5% annually. Contrastingly, the video game business (hardware and software) grew by 47% in 1998 to a record $5.9 billion, compared to 55% growth in 1997 (Gerard Klauer Mattison). In 1999 it is projected to measure $6.3 billion. Video game sales fluctuate with the life cycle of the technology inside of the console. Historically, video game console life cycles are five to seven years. The Sony Playstation® and the Nintendo 64® consoles contain 32 bit and 64 bit processors, respectively.

Comparatively, traditional electronic toys, namely handheld devices and electronic learning aids, totaled approximately $661 million in 1998 (Toy Manufacturer's of America). The handheld electronic toy segment grew by nearl 20% to $456 million in 1998 compared to $381 million in 1997 (TMA). More categories of toys are starting to integrate technology. Plush dolls with embedded electronics grew by 27% in 1998 (TMA). This includes the enormously popular Tickle Me® Elmo doll by Tyco and Tiger Electronics' Furby® . Other categories have potential to leverage technology but are doing so more slowly like board games.

The children's software market has flattened out in the past few years compare

to its sharp growth in the early '90s. This slowdown can be attributed to the consolidation in the software publishing business and the over supply of product. Additionally, children are migrating to the Internet quickly. The following statistics illustrate the growing population of children ages 2 to 12 on the Web. This includes children who are using online services like America Online as well as children who are logging on via an Internet Service Provider.

Online Population by Age Group (millions)	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**
Teenagers (13-18)	4.919	7.150	9.377	11.651	14.644	18.111
Kids (2-12)	2.673	5.061	7.879	11.448	15.967	20.945

Penetration by Age Group						
Teenagers (13-18)	21.5%	30.8%	40.1%	49.3%	61.6%	75.3%
Kids (2-12)	6.2%	11.7%	18.1%	26.3%	36.6%	47.3%

Jupiter Communications, November, 1998

There is clearly an opportunity for Smart Toys to capitalize on this trend, especially in the case of toys that connect to the PC. "Companies that use the Internet as a real enhancement to the play pattern will be successful," says GKM's Sean McGowan. "Internet enhancements will encourage a much higher rate of adoption of product extensions than traditional toy line extensions," McGowan continues. "Kids will be able to demo the new features. Previously the 'razor and razor blade' model was a disappointment to manufacturers."

Additionally, the Internet is the perfect medium for communicating regularly with children, especially in the design phase of new products or during brand building efforts.

Smart Toys measured approximately $400 million in sales in 1998 and are projected to grow at approximately 100% a year. Forrester Research estimates that nearly 80% of all toys by the year 2002 will be Smart Toys. Examples of such toys include interactive plush dolls, hand held electronic toys, games and devices that connect to the PC and to the Internet, robots, and children's cameras.

Following are some examples of Smart Toys from 1998:

- Microsoft's Actimates:
  Barney® ($69), Arthur® and D.W.® ($49), and Teletubbies™ ($59):
  Interactive plush dolls that connect via infrared to the television and the PC
- Lego Mindstorms Robotics Discovery Set ($199)
  Programmable robots that download behaviors from the PC
- Mattel's Interactive Pooh™ ($99):
  Interactive plush dolls that connect to the PC via a cable

- Mattel's Barbie Digital Camera® ($69):
  Digital camera that downloads pictures to the PC via a cable

In 1999, some new players will be launching Smart Toys. Zowie Intertainment will be introducing a line of interactive PlayZones ($50) that connect to the PC and control onscreen software activities: Redbeard's Pirate Quest™ and Ellie's Enchanted Garden™ . Intel and Mattel have joined forces to introduce two digital camera products ($99) for kids under the Intel Play™ brand, including a microscope and a camera that projects a child's image into the PC screen.

Furthermore, Hasbro, Mattel, Lego, Playmates, and others will ship additions to their product lines and these toys will range in price from $29 for a Nerf® gun that recognizes bar codes on the computer screen to $79 for Star Wars® robots.

Growing Up with Technology

As today's children get older at a younger age, their expectations from their toys and entertainment get increasingly more sophisticated. Toy manufacturers previously targeted children under the age of 12 as their core audience. Now, the audience for toys is primarily children under the age of 10 (TMA). Additionally, PC penetration in the home has grown to 50% thanks to the popularity of sub-$1000 PC's. Today, more than half of all US households with children under the age of 18 have PC's, and by 2002, this percentage will rise tc more than three quarters of all US households (Forrester Research).

"Children's lives are highly mediated, and for them to feel confident in today's high-tech world their toys have to reflect that complexity of their world."

Erik Strommen, Ph.D.
Research and Design Lead
Interactive Toy Group
Microsoft Corporation
Hardware Division

Today's children are growing up with technology all around them and they are empowered by it in school and at home. One benefit mentioned previously of integrating technology into toys is that the content of toys can be refreshed so that the activities are continually unique, subsequently extending the game play and appeal of the toy. Also, toys can be personalized by capturing children's voices and images. And Smart Toys can grow with children by providing activities that keep pace with children's rapidly developing cognitive abilities.

That said, not all Smart Toys deliver these benefits, anc the onus is on toy producers to integrate technology in a way that truly delivers enhanced play value for the child. Critics argue that some Smart Toys limit the child's control and imagination. These shortcomings result from the newness of the category and toy makers' struggle to integrate technology cheaply and reliably. As the category grows, toys will become smarter and the technology will become more sophisticated, cheaper, and more robust.

Zowie™ PlayZones

This September two Zowie™ PlayZones will be available in toy stores, computer stores and mass merchants. For $50, kids and parents can buy a toy playset, with a CD-ROM and movable pieces, that connects to a PC. The toys will be extensible with additional software and characters that will be available in the year 2000.

Zowie™ PlayZones allow children to play naturally, as they have for generations

with traditional toys, only now their play is extended with highly engaging worlds inside of the PC. The founding members of Zowie Intertainment worked at Interval Research, searching for a toy-like way to harness the power of the computer. As mentioned above, the Zowie™ PlayZones evolved from this research.

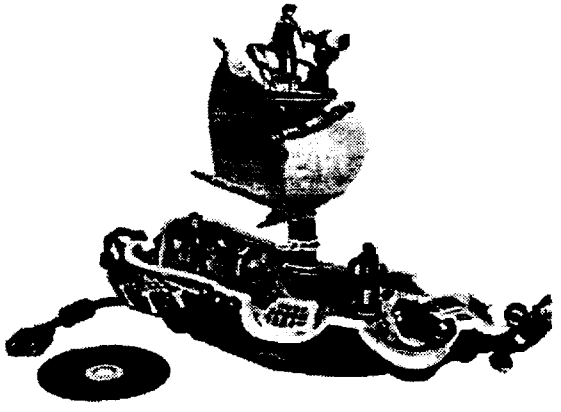
Zowie toy makers have spent thousands of hours observing how children play naturally and have talked with parents about what benefits they would like their children to receive from Smart Toys. Zowie™ PlayZones are designed to extend the benefits of traditional play by stimulating imaginations, enhancing creativity and self-esteem, sharpening critical thinking and problem solving skills, and encouraging social play and cooperation.

Each PlayZone offers children multiple action-packed worlds and games with varying levels of difficulty. Reward-based activities encourage problem solving and improve children's logic skills while promoting feelings of accomplishment and success. No mouse, keyboard, or controller to share means more than one child can play at a given time, encouraging cooperative play and helping to develop positive social behavior.

Both toys are targeted at children ages 4 to 8. A description of each product follows.

Redbeard's Pirate Quest™

Join Errol, Nika, and Ollie as they embark on a pirate adventure to help Captain Redbeard recover his stolen treasure. Fend off enemy skeleton pirate ships and frightening sea monsters, and navigate the ship through iceberg mazes and surprising obstacles on the open sea.



Redbeard's Pirate Quest delivers three types of gameplay:

- *Discovery and Exploration Play* - Redbeard's Pirate Quest allows children to use characters and objects to explore new worlds, summon Redbeard for help, and engage pirates in swashbuckling sword fights.
- *Hands-On Active Play* - Errol, Ollie, and Nika are challenged to avoid jagged icebergs and moving ice floats, shoot giant squids and menacing sea serpents or navigate the ship to avoid surprise attacks from an enemy skeleton vessel - when they look through the telescope, the monitor displays a 360-degree panoramic view as kids rotate it.
- *Problem-Solving Play* - children are given clues, like a message in a bottle to help them accomplish various missions, leading them to Captain Redbeard's treasures.

Ellie's Enchanted Garden™

Ellie's beloved stuffed animals become her playmates as they come to life in her magical garden. Flowerbeds appear and change colors, and Ellie and her friends, Lily and Bingo, dance together to the latest tunes and play familiar schoolyard games such as hopscotch, jump-rope, and hide and seek.

Ellie's Enchanted Garden delivers three types of gameplay:

- *Discovery and Exploration Play* - Ellie's Enchanted Garden allows children to use characters and objects to explore, customize, and beautify their garden worlds.
- *Hands-On Active Play* - Ellie and her friends play hopscotch and jump rope and groove to a variety of songs.
- *Problem-Solving Play* - kids use problem-solving skills to figure out where characters are hiding.

Zowie Power™ Technology

Zowie Power™ is the technology inside of the Zowie™ PlayZones that connects the toys to the PC and allows children to control onscreen activities through the movement of 3D physical characters and objects on the toys. For example, in Redbeard's Pirate Quest, by placing an action figure next to the steering wheel on a toy pirate ship and then turning the wheel, a child can navigate their ship on a virtual ocean on their computer screen.

In more technical terms, Zowie Power™ offers a portfolio of patented sensing and recognition technologies that track the movement of pieces in four dimensions: horizontal (X), vertical (Y), height (Z), and rotation. Objects are tagged with a small piece of technology and they are tracked by an antenna which is embedded in the toy. The antenna relays this sensing information to a custom computer chip which is also embedded in the toy, and the chip then sends information to the PC through Zowie™ software. Zowie™ software controls the activities the child sees on the computer screen.

Zowie Power™ technology is robust, low cost, and very flexible. In time, Zowie will share its software development kit with inventors and other toy manufacturers to help expand the category of Smart Toys.

The Frog Pond, Zowie's Child Research Lab

At The Frog Pond, Zowie's Child Research Lab, we observe children playing with all kinds of toys and computer products, not just Zowie products, to better understand children's natural play styles. Children from all around the San Francisco Bay Area participate in our studies and are recruited through advertisements in local newspapers and parent magazines. User tests occur on an average of twice per month with sample sizes of 8 to 12 kids. For large scale tests involving up to hundreds of kids, the Frog Pond will partner with third party research firms like Cheskin Research and will travel around the country to test kids and parents outside of the technology-centric Bay Area.

We use a variety of testing methods including free play, guided play, questionnaires, and discussion. We also use a variety of materials such as paper prototypes, character drawings, off-the-shelf toys, and computer prototypes. Most of our studies are observations of one or two children playing with a computer prototype while the parent and our producers and engineers watch from behind a one-way mirror. We also conduct focus groups with children and parents. All of our studies are reviewed by a Human Subjects Committee that ensures all participants are given the proper information concerning the research and that our procedures and policies meet appropriate legal and ethical guidelines.

The Frog Pond is headed by Helen Shwe, Ph.D. Helen received a doctoral degree in Developmental Psychology at Stanford University. Before joining the Zowie team, Helen worked with several companies including Hasbro Interactive, Apple and Interval Research in their usability labs helping to design and run studies on children's CD-ROM games and high-tech toys. Jenny Percer, research and design consultant, is pursuing her doctoral degree in Developmental Psychology also at Stanford University.

Play Benefits

What is play? If given the choice, children would play all day long and forego the necessities of sleep, food, and any other distractions. Children revel in being silly and boisterous and spend the majority of their waking hours exploring their environments and engaging in make-believe activities. Although play has proven difficult to define, children are quite skilled at showing a wide range of play activities and demonstrating that play time has no limits - children will play until the point of exhaustion!

Play Benefits of Zowie™ PlayZones

- Inspire Fantasy Play
- Encourage Cooperative Play
- Promote Hands-on Active Play
- Encourage Child-directed Play
- Strengthen Symbolic-representational Skills

Learning Through Play

Though some may view play as a frivolous activity, developmental psychologists believe that it serves important functions for children. It has been widely proclaimed as a significant force in cognitive, social, and emotional development with specific advantages for tool use and problem solving (Bruner, 1972), language and thinking (Vygoysky, 1967), self-concept (Mead, 1934), and personal adjustment (Erikson, 1950).

"Zowie PlayZones have tremendous play benefits because not only do you have the tried and true play of figurines and 3D manipulatives but you get the surprise and excitement of seeing your own play appear on a computer screen and the characters come to life."

Debra Lieberman, Ph.D. Media Research and Design Consultant and Vice President of Research, Click Health, Inc.

Technology is influencing children's play. Smart Toys combine technology with physical toys - incorporating the best of both worlds in the next wave of entertainment products. For the most part, Smart Toys have received a positive review, however, some researchers and parents are asking "Is smarter really better for children?"

Smart Toys should be designed to enhance rather than direct children's natural play patterns. Toys should not usurp control of the play process but instead should use computers to intelligently extend a classic type of play. This design philosophy has been the focus of Zowie™ PlayZones, Zowie Intertainment's first line of products. Zowie™ PlayZones are the only smart toys that enable children to manipulate and change on-screen worlds and characters through traditional play. The result is a new and improved play environment that embodies many of the qualities that make play fun and good for kids.

Inspiring Fantasy Play

> *"They're real and they talk to each other and are best friends."*
> - Michelle (age 8)
>
> *" It's cool that the animals talk!"*
> - Jill (age 8)
>
> (Two girls talking about the characters in Ellie's Enchanted Garden™ .)

Children can spend countless hours engaging in fantasy play. Pretending begins in the late toddler period and expands rapidly during the preschool years (Dunn 1985). Piaget, a pioneer of child psychology, was one of the first to view preten play as serious business and recognized that it promotes children's social, emotional, and intellectual development. Pretense has been viewed as partially responsible for the development of a plethora of skills including symbolic representation (Singer, 1973), creative and flexible thinking (Lieberman, 1977; Singer, 1973; Smilansky, 1968), and self-confidence and self-regulation (Singer, 1973). For example, pretend play enables young children to try new roles and by assuming those different roles children are encouraged to see things from others' points of view and understand the needs of others. Role play also helps children establish their own self-identity by highlighting the discrepancies between their own perspectives and those of their playmates.

Importance of Pretend Play

Research on fantasy or pretend play has dominated the play literature over the past several decades (for a review see Rubin, Fein, and Vanderberg, 1983). Singer and Singer (1981) conducted one of the first studies to examine

children's patterns of emotions during spontaneous play to determine whether positive emotions related in any systematic way to fantasy play. In a longitudinal study with several nursery schools, Singer and Singer found that positive emotions such as joy and liveliness were positively correlated with imaginative play. They also found that children who often engaged in make-believe play emerged across a year's time as those who were engaged in a good deal of smiling, laughter, and motor activity.

Similarly, Tower (1984) found that imaginative children were more lively, concentrated better, tolerated frustration better, and were generally more alert and joyful. Furthermore, preschool children who pretend a lot are judged to be more creative, more socially mature, and more popular than children who pretend less often (Connolly and Doyle, 1984; Connolly, Doyle, & Reznick, 1988; Dansky, 1980). Developmental researchers also suggest that imaginative play can contribute to a child's ability to recognize, express, or control emotions and that such play can influence the emergence of a differentiated sense of self.

In addition to the work on social and emotional development, play researchers have investigated the links between fantasy play and cognitive skills such as language development. Lewis' (1973) work with kindergartners found that children already identified as playing more imaginatively also excelled in a picture interpretation task and in the extent and use of their vocabulary. Similar relationships between language complexity and richness have emerged from several other studies as well (Singer and Singer, 1976, 1981; Olszewski, 1987).

Another interesting approach to assessing the advantages of imaginative play is providing children with structured experiences and adult role models in pretend games. These studies have shown that fantasy play training can lead to significant improvements in verbal intelligence, mathematical readiness, perspective-taking, concentration, complexity of play, and group problem solving (Freyberg, 1973; Saltz and Brodie, 1982; Smilansky, 1968). In summary, individual differences in the variety and frequency of fantasy play are associated with richer and more complex language skills, more positive emotions such as joy and laughter, enhanced creativity and imagination, and the ability to interact successfully with other children.

Theory of Mind

Recently, pretend play has received renewed attention in the developmental literature through the study of children's understanding of the mind. One of the hottest areas in developmental psychology is exploring what children understand about mental states such as belief, desire, perception, and intention commonly referred to as Theory of Mind. Researchers in this field are asking, "What does children's ability to pretend tell us about their understanding of the mind?" Again, it was Piaget who first attempted to answer this question and he argued that pretense shows the development of the child's capacity for symbolic representation (the ability to use one thing to stand for another). More recent research suggests that young children may think of pretense as a special kind of activity rather than thinking about the mental states involved (Lillard, 1991). For example, if you are hopping up and down like a rabbit but have never seen a rabbit and never heard of one, then are you "pretending" to be a rabbit? Young children would say "yes" because their understanding of pretense is limited to the physical activity rather than the mental representational aspect of pretense. In either view, pretend play is viewed as an important precursor to understanding the nature of the mind. Through pretend play, children have their first experiences with imaginative and hypothetical worlds that lead to a complex understanding of their own and others' mental states.

Zowie™ PlayZones Encourage Fantasy Play

By blending the physical world of the toys with the onscreen world of the software activities, Zowie™ PlayZones create a unique environment for fantasy play. PlayZones take advantage of children's natural tendency to enter the worl of make-believe and introduce a new way for children to express their imaginative personalities. Zowie™ PlayZones are designed for children between the ages of 4 and 8 when they are in the early childhood period is known as "th high season for imaginative play." According to a parent who observed her daughter playing with the PlayZones, "These toys are an interactive play house that goes beyond what kids can imagine . . . it encourages creativity and discovery while uncovering the possibilities. I really liked it as a toy and I see that they're learning critical thinking skills and creativity."

In the Zowie child studies lab, we have observed a wide range of fantasy play scenarios among children of various ages and among both girls and boys. Many children created their own stories while playing with the play set away from the computer (before they even knew that it connected to the computer) and then they experienced a new fantasy world when the story and characters were brought to life on the screen. After the computer play ended, several children continued the fantasy stories that were introduced in the software and blended those with their own imagination.

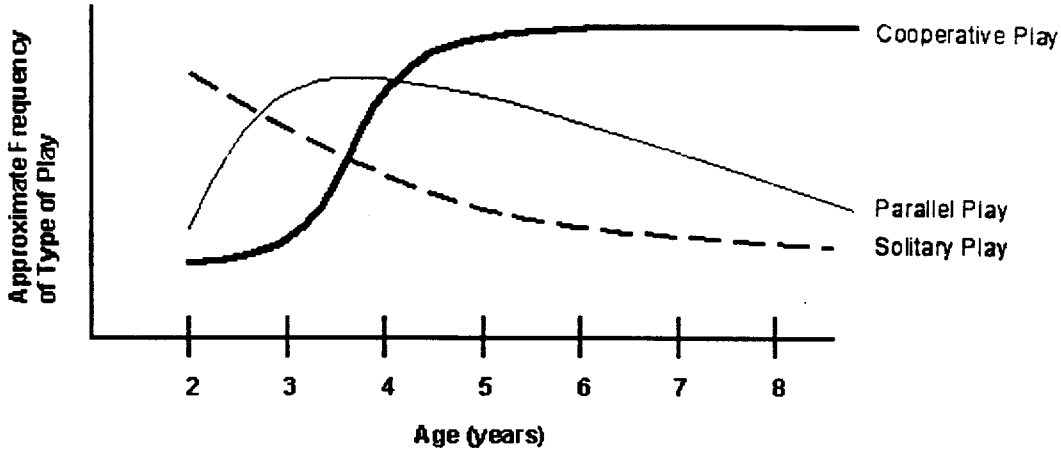
The PlayZones "create different types of imaginative play because of the fact that kids are not completely dependent on what happens on the screen to support the play. The play can be a supplement of what's going on on the screen . . . the screen isn't solely creating the play experience," says Eric Johnson, Ph.D., a toy industry expert at Vanderbilt University's Owen Graduate School of Management, in Nashville, Tennessee. In addition to the fantasy onscreen worlds of the PlayZones, children can physically manipulate the characters to create their own stories on or away from the computer.

Encouraging Cooperative Play

> *"You want your children to play together and this (Zowie™ PlayZones) is the natural thing for that. I just think it's so valuable for kids to know how to play together and they can't on most computer games."*
>
> - Jill, mother of two

Early research on play focused on naturalistic observations of children and categorized both the social and cognitive functions of play (Parten, 1932; Rubin Watson, Jambor, 1978). In a classic study by Parten (1932), researchers analyzed the play interactions of young children and identified three categories: solitary play (i.e., playing alone and independently with no attempt to interact with other children), parallel play (i.e., playing alongside other children with some similar materials but no real interaction or cooperation), and cooperative play (i.e., play organized around a theme with the purpose of carrying out some activity or attaining some goal). A more recent study by Harper and Huie (1985 has confirmed Parten's finding that solitary play declines over age while there is an increase in cooperative play. Although solitary and parallel play remain quite common throughout the preschool years, the proportion of cooperative play

increases (Clark, Wyon, & Richards, 1969; Parten, 1932). This developmental trend makes sense given that cooperative play facilitates children's social competence and offers the opportunity for social interaction.



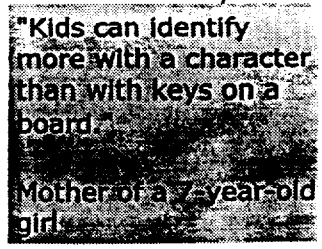
Source: Based on information from "Social Participation Among Preschool Children" by M.B. Parten, 1932, *Journal of Abnormal and Social Psychology*, 27, pp. 243 – 269.

Benefits of Social Play

Piaget (1965) recognized the contribution of social experience through play to the development of role-taking skills and mature social judgements. He argued that young children become more aware of the discrepancies between their own perspectives and those of their playmates by assuming different roles when playing together. Piaget proposed that cooperative play interactions are an important contributor to social perspective taking and they encourage interpersonal understanding. He believed that children learn to integrate their points of view with those of their companions, or compromise, in order for play to continue when conflicts arise. The cooperation of peers is an essential ingredient to social play. The more experience children have playing with each other, the more they learn to understand other people's perspectives and learn to interact successfully with others. Children also become less centered on their own thoughts and feelings and increasingly attuned to the feelings of others.

Traditional PC Play Does Not Facilitate Cooperative Play

Although it is difficult to categorize children's interactions with computers, most of the traditional CD-ROM software designed for children encourages solitary play, or parallel play at best. When children are engrossed in their favorite game on the computer, they tend to tune out the rest of the world and focus their attention only on the computer screen. Although this focused and solitary state is conducive to some types of learning, it does not support social interactions with friends, siblings, and parents. The potential for social play around the computer is a lost opportunity of traditional children's software; however, PC's can evolve to use several different input devices and enable various multi-player experiences.



Another limitation of computer software that uses the mouse and keyboard is

the problem of sharing only one input device. Cooperative social interaction at the computer is quite a rare phenomenon, especially among young children who are anxious to have their turn to control the mouse. "I have gone through five different mice! You know they fight, 'Give me the mouse! Give me the mouse!' And then it's gone," says Jude, mother of two. "I think it's a lot friendlier than using the mouse, and a lot easier for little kids," adds another parent.

Zowie™ PlayZones Enhance Social Play

"Much more than a traditional CD-ROM, specifically because of the multiple, simultaneous inputs, this (Zowie™ PlayZones) encourages, allows, and facilitates cooperative play. There is very rarely a situation where one child has to sit passively while the other has control."

Rita Levinson
Founder and President of the Screen Play Interactive Media Group

In contrast to the typical non-social play environment fostered by traditional computer software, Zowie™ PlayZones encourage cooperative play by allowing more than one child to easily control the on-screen environment with different characters and objects. As one of the children (age 7) in the play studies pointed out, "And you have a lot of characters so more than one person can play too. More than three people can play because of these too (pointing to several objects)." Furthermore, PlayZones encourage children to work out their own strategies for sharing without providing directed turn taking. Children are free to choose which character they would like to play and how those characters interact with each other in the onscreen environments.

We have observed many children playing with their friends or siblings with PlayZones and have noticed several types of interesting interactions. For example, two brothers with a 5-year gap in age (5 and 10) were playing the cannon game in Redbeard's Pirate Quest and the younger one said, "You point and I'll shoot." This type of cooperative interaction among siblings and friends, even if they are several years apart in age, has been a common observation in the child studies lab. "I think it will promote sharing and I hear them say, 'So now you be Bingo and I'll be Ellie.' And with Redbeard they say 'I want to steer. OK, well then you do the cannon,'" commented one of the mothers who watched her two children interacting with PlayZones.

Zowie™ PlayZones do not try to mimic familiar social interactions but rather let children discover those on their own.

Another play benefit of Zowie™ PlayZones is that they encourage children to play with each other instead of focusing their full attention on the toy. Proponents of Smart Toys boast that they encourage social interaction by providing a unique interface that uses the social dynamics of children's play experiences. Many Smart Toys, however, fall prey to the criticism that rather than teaching important social concepts they give pre-programmed responses to whatever children tell them to do. With PlayZones "kids can really be encouraged to play with a friend and that makes the game even more interesting," says Donna Mumme, Ph.D., developmental psychologist at Stanford University. "Having a social partner, a real live social partner, can improve children's play and that is a real benefit."

Promoting Hands-on Active Play

> *"I like using the toy better because your hand gets tired typing in stuff (on the keyboard) and this you can move*

around and it's fun so you can make this go over here (moving a character). It's a little bit nicer."

- Christina (age 7)

Benefits of Active Play

"Technology is active. Toys are active. Kids want to be active."

Erik Strommen, Ph.D.
Research and Design Lead
Interactive Toy Group
Microsoft Corporation
Hardware Division

One of Piaget's central themes in his theory of development is the importance of action on learning and cognition. He proposed that thought arises from action and that children are active players in their intellectual development. Piaget viewed children as constructivists who create new understandings of the world based on their own experiences. Children are naturally curious and active explorers and prefer to learn by doing rather than watching. This view of learning as an active rather than passive process has been a guiding influence in several other theories of cognitive development such as Seymour Papert's theory of constructionism (learning through design). Papert's renowned research on education and technology at the MIT Media Laboratory was the first to recognize and articulate how computers can fundamentally revolutionize learning and education (see Papert 1993a, 1993b, 1996).

As mentioned previously, some parents worry that their children's interaction with computers is typically a non-social and narrowly focused experience which often implies that the opportunity for hands-on active play is limited. Most children are familiar with using a mouse and keyboard but a somewhat unexpected problem is that children are becoming too familiar with these standard user interfaces. A common observation of children in front of the computer is a blank stare at the screen with the mouse in hand and the usual point-and-click actions over and over again. Some have used the term "Zombie Effect" to describe the way children seem to tune out the rest of the world when they are in front of the computer.

"One of the biggest criticisms of traditional CD-ROMs for young children is that they're not hands-on enough. Kids learn best through active, physical manipulation, kinesthetic movement through their world, their environment, their play objects. This playset (Zowie PlayZones) allows all of the benefits of interactive computer play but adds that dimension of direct manipulation."

Rita Levinson
Founder and President of the Screen Play Interactive Media Group

Zowie™ PlayZones Encourage Physical and Active Play

While the mouse and keyboard encourage a passive learning environment, Zowie™ PlayZones offer the opportunity for children to interact physically with the computer. Compared to traditional toys, the computer alone can't offer hands-on, three-dimensional play. But all of this is changing with the benefits of Zowie™ PlayZones. Children can control the action on screen by moving real toy characters on a 3-dimensional play zone. This hands-on active play takes advantage of their natural style of playing with toys and enhances their actions with imaginative on-screen worlds. "It's a lot more user friendly . . . product friendly . . . very child friendly, touchy-feely. . . what do you call that?

Ah, tactile! So it brings that aspect back into play . . . not just everything happening up there (on the screen)," said one of the mothers in our focus groups. "You're in control."

Early research at Interval Research focused on understanding the use of physical objects in the classroom. These observational studies revealed that teachers use physical manipulates extensively in kindergarten and the early grade school years in math, science, and art activities. Teachers use physical objects to help their students learn memory and association skills and to help them visualize and conceptualize abstract ideas. The Montessori Method, developed by Italian physician Maria Montesorri, stresses the importance of sensorimotor experiences in early learning. This method uses concrete and real materials to capitalize on the child's concrete and active learning style.

We have also observed the excitement of children yelling, "Here we come!" and "There's a ship . . . Hey, let's go around the ship!" as they move characters around on the pirate ship and steer it with a small wheel. Even simple gestures such as lifting characters way over the playing board and seeing them disappear on the screen have delighted our youngest audience. As with many of our observations, the differences we see are hard to capture quantitatively but the quality of children's play with Zowie™ PlayZones is definitely distinct from the usual passive computer experience. When asked to compare her experience using a toy to interact with the computer instead of the mouse and keyboard, one of the children in our studies responded, "And other games, your hand gets kind of tired but this one you can have your hand moving around a little bit and you get to choose where you want to go." She also thought of an interesting strategy to use with mom, "I like it because if your mom says you can't watch TV and anything with screens then you can just play this (the toy, away from the computer) and then when you can (watch a screen) you can play this and the computer."

"The PlayZones are clearly more like the kind of play that kids are likely to normally engage in. So obviously you can do the same things with your figures that you can be doing with other action figures or dolls," says Professor Mark Lepper of the Psychology Department at Stanford University. "And kids don't do that with mice."

Encouraging Child-directed Play

> *"It's cool to control where the characters go!"*
>
> - Michelle (8)

Part of the magic and thrill of play is being the boss. Think of all the times that you've heard a young child say, "Now I'll be the mommy and you be the baby." Play theorists have highlighted this quality of play and described play as spontaneous and voluntary with the actions freely chosen by the player (Garvey 1990). In a more general sense, developmental researchers have studied children's self-efficacy, the belief that one can control the events in one's life. Bandura's (1982, 1986, 1989) work suggests that self-efficacy may regulate a child's attention, retention, and motivation. His research has shown that children are most likely to undertake, persist at, and ultimately succeed at nove or ambiguous tasks that they think they are capable of mastering, whereas they

tend to avoid or give up on activities at which they feel less capable or efficacious. A key concept in Bandura's theory is that our perceived self-efficacies may be more important than our actual accomplishments at determining our interests, objectives, and other personal attributes. For example, when children think they are good at a particular activity such as computer games, they will develop more motivation, interest, and persistence in that activity. Perceived self-efficacy is linked to increases in self-esteem and can lead to higher levels of performance as a result of increased effort and persistence on a particular task.

Piaget also stressed the importance of self-directed learning and exploration. He believed that young children construct their own meaning by integrating new knowledge into their previous knowledge and experiences. Because children are constantly updating their understanding of how the world works, Piaget recommended learning experiences that emphasize self-direction and autonomy. Play that allows children to take control helps them build on their prior experiences and is a sound preparation for later intellectual development.

Before the introduction of toys that can talk and respond to children's actions, all children had to worry about was other children (or adults) trying to tell them what to do during play time. Now there are some Smart Toys that direct children's play experiences and many experts find this worrisome. Just imagine a *toy* telling your child, "Now I'll be the mommy and you be the baby." Some children may find that amusing but most would become quite frustrated and irritated with a toy if all it did was bark orders at them.

Zowie™ PlayZones Allow Children to Direct Play

In contrast to placing children in a secondary role, Zowie™ PlayZones let children take control and guide their own play experience. Watching children in traditional, non-tech-driven play, we have observed that they want to direct the action of play. "I see with this (PlayZones) the child has more control over the play than with the computer game where it has more control," said Jill, mother of two young children.

Zowie™ PlayZones provide an intuitive and familiar interface to the computer. In contrast to other interfaces such as the mouse and keyboard, the PlayZones are designed *for children*. This natural play environment around the computer is especially important for young children who have had little or no experience with computers since they might be intimidated by the designed-for-adults interface of the mouse and keyboard. In our play research, we have observed children confidently reach for the toy pieces and take control of the play experience. The PlayZones allow children, not the computer, to drive the interaction.

Each PlayZone has several activities that allow children to simply discover and explore. If children choose to embark on a mission, they are free to choose which activities they would like to play in order to obtain points or tokens. For example, in Redbeard's Pirate Quest children are trying to find buried treasure in several locations but they can decide where to look for the treasure and which games they want to play to collect pieces of treasure.

"You know what I really like about this idea is that it's different from a game in that there's not a win or a lose . . . no matter what it's a win win for them whatever it is that they are doing. So they can feel safe in exploring everything and trying it," explains Lisa, mother of 2 girls. Play studies at Zowie have shown

that some children fall in love with a single activity and choose to just play that game over and over again. While children are prompted to try other activities, the final say is up to them and there are no characters telling children what to do.

Strengthening Symbolic-Representational Skills

> *"This is going beyond what she was doing before and she can see that with the same setting you can envision the world in different possibilities, and I think that's an important skill to see that you can visualize . . . She can make a change . . . It really makes an imprint."*
>
> - Lisa, mother of two

One of the biggest milestones in a child's cognitive development is understanding that one thing can stand for another. Children's symbolic representational skills include their understanding of pictorial representations and models as well as their developing capacity for pretend play. This section will focus on children's understanding of pictures and models since an earlier section discussed fantasy and pretend play. While young children readily recognize that pictures (i.e., drawings, paintings, photographs) represent objects in the real world, they have trouble appreciating the relation between a scale model and the larger space that it represents (DeLoache, 1991).

Benefits of Enhanced Symbolic-Representational Skills

In a series of studies with young children, DeLoache (1991) examined children's symbolic functioning by presenting them with a hiding task in which they had to use a picture or model to solve the task. For example, children's reasoning from a scale model to a full-sized room was investigated by having young children watch as a miniature toy was hidden somewhere in a scale model of a room. Then the child was asked to find a larger, analogous toy concealed in the corresponding place in the room itself. For example, children saw "Little Snoopy" hidden behind the miniature couch in the model and then were expected to search for "Big Snoopy" behind the full-sized couch in the room. DeLoache found a large difference in performance for groups of children that were only a few months apart in age which is very rare in the developmental literature. While 3-year-olds easily succeeded at this task, children only 6 months younger had no idea where to look for the hidden toy. Another interesting finding from DeLoache's studies was that the younger children performed much better on the same task when a picture was used instead of a model. These findings suggest that young children's understanding of symbolic representations is quite fragile and dramatic differences can be found when they are presented with a more familiar symbolic medium.

Zowie™ PlayZones Blend Virtual and Physical Worlds

Children who succeeded in the model version of DeLoache's task had to recognize the correspondence between the model and the room, map the elements of space onto those of the other, and use their knowledge of where the miniature toy was hidden to figure out where the larger toy must be. A similar line of reasoning must be used to solve some of the puzzles presented to children in Zowie™ PlayZones. For example, children can play a hide-and-seek

game in Ellie's Enchanted Garden where they have to recognize the correspondence between the 3 dimensional board and the 2 dimensional representation on the screen, map the positions of the objects and characters o the board to those on the screen, and use information provided by clues on the screen to figure out where to "look" for the character on the board. Zowie™ PlayZones allow children to experiment with their understanding of representations by blending the physical and virtual worlds. Contrary to adults' expectations, young children seamlessly blend the on-screen and physical worlds into one holistic experience. We have observed children in our play research easily split their attention between the screen and the toy.

Although DeLoache's work suggests that young children have some understanding of models by age 3, their understanding of symbolic representational skills is rapidly changing throughout the preschool years. The combination of a 3 dimensional board and characters with a 2 dimensional screen in Zowie™ PlayZones helps to facilitate children's representational understanding and enhances their spatial skills. Symbolic representational skills are a landmark of development in early childhood with links to language competence, number skills, and drawing and other forms of artistic representation.

Conclusions

We have explored how Zowie™ PlayZones enhance children's play by harnessing the power of the PC and introducing children to a whole new dimension of play. Because of the strategy of designing toys based on an understanding of how children play, these smarter Smart Toys inspire children's fantasy play, encourage cooperative play, promote hands-on active play, encourage child-directed play, and strengthen symbolic-representational skills. Zowie™ PlayZones deliver play experiences that enhance children's natural play patterns rather than changing or directing them.

As children demand more sophistication from their toys, manufacturers will need to collaborate with technologists to deliver experiences that are truly unique and valuable, and that use the technology in a meaningful way. Zowie intends to continue to lead the way by making high tech entertainment experiences that deliver the solid benefits of traditional play.

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TOYS

Silicon Valley Teaches Toys New Tricks

By DEAN TAKAHASHI
Staff Reporter of THE WALL STREET JOURNAL

Intel Corp., not content to be inside most personal computers, also wants a place in the toy chest.

The semiconductor giant, working with **Mattel** Inc., is developing a line of toys that work with PCs to deliver new interactive experiences. Intel's X3 Digital Video Microscope, one of two products scheduled for release this coming fall, magnifies slimy slugs, dust bunnies or anything else you want to examine and displays the image on a computer screen. Its Me2 Cam, a digital camera atop a PC, captures kids' video or still images and transfers them into a cartoon-like environment, creating a kind of live TV fantasy.

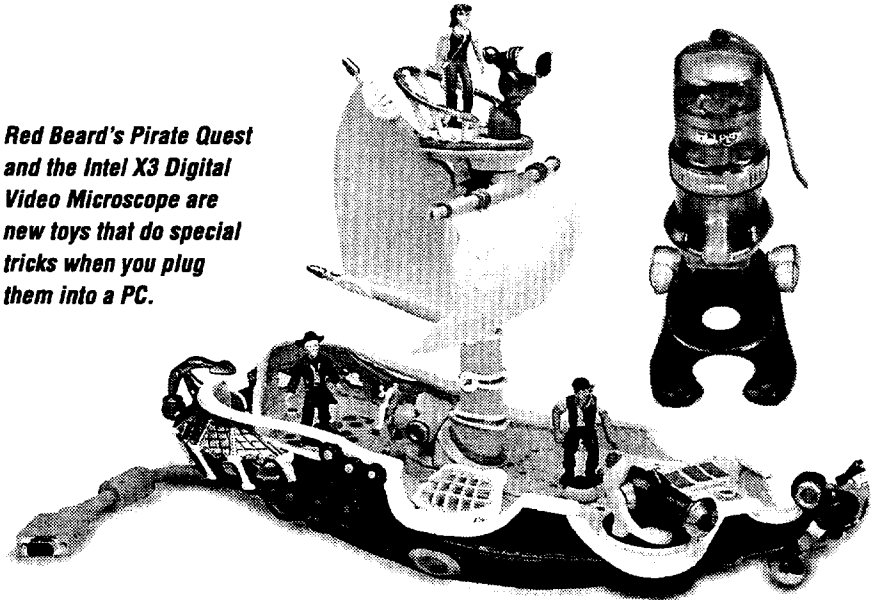
Intel's first move into toys is one of the biggest developments in toyland as the industry prepares for the International Toy Fair in New York next week. It reflects a broader push by established companies and new entrants to boost the IQ of toys, combining moving images and real-life play in ways that are less passive and more intellectually stimulating.

For example, **Zowie Entertainment** Inc., a start-up funded by billionaire Paul Allen, will show products that include a pirate ship that connects directly to the computer in lieu of a computer mouse or keyboard. A child can press a button on the toy and lob a cannon ball at another ship on the PC screen.

"Parents have told us in our research that they're tired of kids staring blankly at the computer and clicking the mouse," says Amy Francetic, Zowie's vice president of product development. "We see this as a way the computer can extend their normal play activity."

The new smart toys are expected to sell for $50 to $100. Mattel will make and distribute the Intel toys, which will carry the brand name Intel Play and cost about $99. **Microsoft** Corp., **Hasbro** Inc. and **Lego Group** AG. are also expected to describe updates to their interactive toys at the toy fair.

Few new toys become major hits. But Intel, which earned $6.1 billion last year on sales of $26.3 billion, doesn't expect a huge payoff from the low-margin toy business. Rather, the Santa Clara, Calif., company wants to accelerate the pace of innovation in toys and other devices that attach to PCs—stimulating demand for the chips that account for the bulk of its business. It expects to stimulate the market further with toys that include speech recognition and Internet connectivity.



Red Beard's Pirate Quest and the Intel X3 Digital Video Microscope are new toys that do special tricks when you plug them into a PC.

"The whole peripheral category is going to explode going forward," says Ronald Whittier, senior vice president of Intel's content group. "This is all connected computing for us. If there will be a billion connected computers, there could be 10 billion connected peripherals."

Microsoft helped invent the smart-toy category a couple of years ago with its talking Actimates, including a plush Barney figure that utters playful sentences by virtue of a software program on the computer. The Barney toys sold hundreds of thousands of units and generated $50 million in their first year, says Donald Poyner, group product manager in hardware at Microsoft, which is based in Redmond, Wash.

At the toy fair, Microsoft plans to unveil new Actimates based on the characters in PBS's popular "Teletubbies" TV show. The Teletubbies Actimates can make running commentaries on TV shows and ask children questions, such as "Do you want to dance?" or "Is he sad?"

The new smart toys are designed to offer more than a predetermined menu of activities. "Tech toys in the past have been sophisticated trained seals that go through a repertoire of tricks and aren't a great deal of fun," says Sean McGowan, a toy analyst at Gerard Klauer Mattison. "With drops in costs for computing power, you can create new play patterns."

Intel's new microscope includes a digital camera connected by a wire to a 200-megahertz or higher-performance PC and displays images 100 to 350 times their actual size on the computer display. The child can record the image and even turn it into a video presentation.

(over please)

"The kids can look at ants from the backyard, dust bunnies from the refrigerator, scabs on their arms, or make time-lapse movies where they can watch brine shrimp grow in a water dish," says Mary Ann Norris, Mattel's director of strategic planning.

Intel developed the underlying technologies at its Intel Architecture Labs in Hillsboro, Ore. In the past, Mr. Whittier says, Intel might have spun off the technology because it wasn't related to its core business of making computer chips. But the company has taken a more aggressive stance about using its resources to build markets, including equity investments in more than 200 smaller companies.

Engineers from Intel and Mattel collaborated in a downtown Portland building that was once used to create Viewmaster toys. While Intel wanted Mattel's toy expertise, benefits of working with Intel also were apparent to Mattel, which recently paid $3 billion for education giant Learning Co. "We have to be as confident dealing with bits as we are with atoms," says Douglas Glen, a senior vice president at Mattel's El Segundo, Calif., headquarters.

Zowie next week will show Red Beard's Pirate Quest, Ellie's Enchanted Garden and Muppets From Space, the latter based on a coming Muppets movie from **Jim Henson Productions** Inc. The toys, expected to come out this fall at $50 to $60, connect to a computer and are enhanced with CD-ROMs.

The pirate figures on Red Beard's ship, for example, have sensors that detect their position on the toy ship and send signals to the computer. When a child moves a pirate, the character's image moves across a similar ship on the computer screen that shows the action from different angles, such as the view of the ocean from the crow's nest.